

# **Smallholders and the Environment**

## **An Assessment Tool and Integrated Index for Sustainable Oil Palm Production**

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Pérennes / CIRAD-Persyst (France)

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## Summary

- ✓ An initiative for an international network on agro-environmental indicators and sustainability index for oil palm production;
- ✓ An emphasis on ‘impact measurement’, according to ICOPE’10 thematic;
- ✓ A detailed introduction to a proposed method for ‘integrated farm sustainability assessment’;
- ✓ A set of case studies for testing applicability and allowing critical review of the proposed approach;
- ✓ An opportunity for smallholders to equating their managerial capacities with large scale organizations, favoring a fairer playing field for certification and market insertion.

- ✓ **The Roundtable for Sustainable Palm Oil (RSPO) has strived to assemble the main stakeholders of the sector to propose a set of Principles, Criteria and Indicators (PC&I) for promotion of “*Institutional Social Responsibility*” in palm oil production.**
- ✓ **This very commendable and carefully negotiated procedure lists eight Principles, each comprising a set of Criteria and Indicators (PC&I) that can be checked for conformity relative to production practices and business relations, providing the bases for certification.**

✓ **A complementary environmental management procedure is now being proposed in a cooperation involving Cirad (Unité Performance des Systèmes de Culture de Plantes Pérennes), Embrapa and partners, in an international network aiming to:**

- (i) preparing farmers / plantations for certification,**
- (ii) checking the impacts effected by PC&I adequacy at the field level (i.e., document improvements),**
- (iii) environmental management decision making on how to promote continuous improvement (Principle 8).**



**To be amenable as an environmental management and certification preparation tool, an integrated indicator system must conform with a series of requisites:**

- ✓ Allow assessments in the most diverse rural contexts (from smaller to larger, from family-tended to technically advanced landholdings), in varied environmental settings, at the specific scale of the rural establishment;
- ✓ Include indicators relative to the ecological, economic, socio-cultural *and* management aspects implicated with local sustainable development, meeting the demands of consumers / environmental sectors (and the diversity of PC&I for oil palm);

- ✓ Express results in a simple and straightforward manner to farmers, rural entrepreneurs, decision-makers, and the general public;
- ✓ Facilitate the detection of *critical control points* for management correction;
- ✓ Be constructed in a user-friendly interface, capable of offering an integrated sustainability index, so contributing toward environmental management and eco-certification, according to the demands of farmers / producers, their organizations and stakeholders in general.

✓ **A proposed solution:**

**Weighted environmental impact  
assessment system for Oil Palm  
(APOIA-OilPalm)**

# ***APOIA-OilPalm***

## **Sustainability dimensions**

**Landscape Ecology**

**Environmental Quality**

**(atmosphere, water, and soil)**

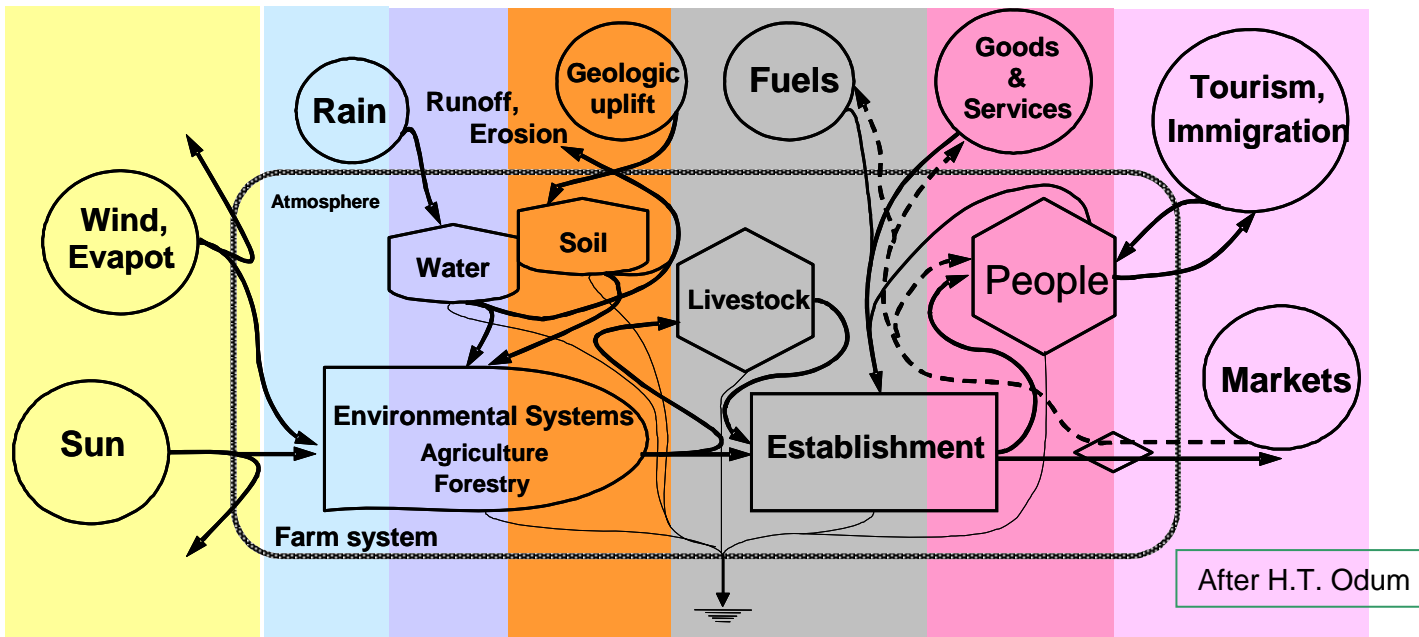
**Socio-cultural Values**

**Economic Values**

**Management and Administration**



A systemic, *adequate* and *sufficient* set of objective, quantitative indicators.



## 1 Landscape Ecology

- 1 Natural habitats physiognomy and status
- 2 Management of agricult. production areas
- 3 Management of confined activit/anim husbandry
- 4 Preservation of HCV habitats
- 5 Ecological corridors
- 6 Degraded areas reclamation
- 7 Landscape diversity
- 8 Productive diversity
- 9 Incidence of vectors of endemic diseases
- 10 Extinction risk of relevant species
- 11 Fire hazard
- 12 Geotechnical hazard

## 2 Environmental Quality

### Atmosphere

- 13 Particles/smoke
- 14 Odor
- 15 Noise
- 16 Carbon oxides
- 17 Sulfur oxides
- 18 Nitrogen oxides

### Water

- 19 Dissolved O<sub>2</sub>
- 20 Fecal coliforms
- 21 BOD<sub>5</sub>
- 22 pH
- 23 Nitrate
- 24 Phosphate
- 25 Turbidity
- 26 Chlorophyll a
- 27 Conductivity
- 28 Visual pollution
- 29 Pesticides potential impact

### Groundwater

- 30 Fecal coliforms
- 31 Nitrate
- 32 Conductivity

### Soil

- 33 Organic matter
- 34 pH
- 35 Phosphate
- 36 K exchangeable
- 37 Exchangeable Mg (& Ca)
- 38 Potential acidity
- 39 Sum of cations
- 40 Cation Exchange Capacity
- 41 Volume of bases
- 42 Erosion

## 3 Economic Values

- 51 Establish net income
- 52 Diversity of income sources
- 53 Income distrib.
- 54 Current indebtedness
- 55 Land value
- 56 Dwelling quality

## 4 Sociocultural Values

- 43 Access education
- 44 Access basic services
- 45 Consumption stand.
- 46 Access sport leisure
- 47 Conservation legacy
- 48 Employment quality
- 49 Occupational safety
- 50 Qualif. employment

## 5 Management

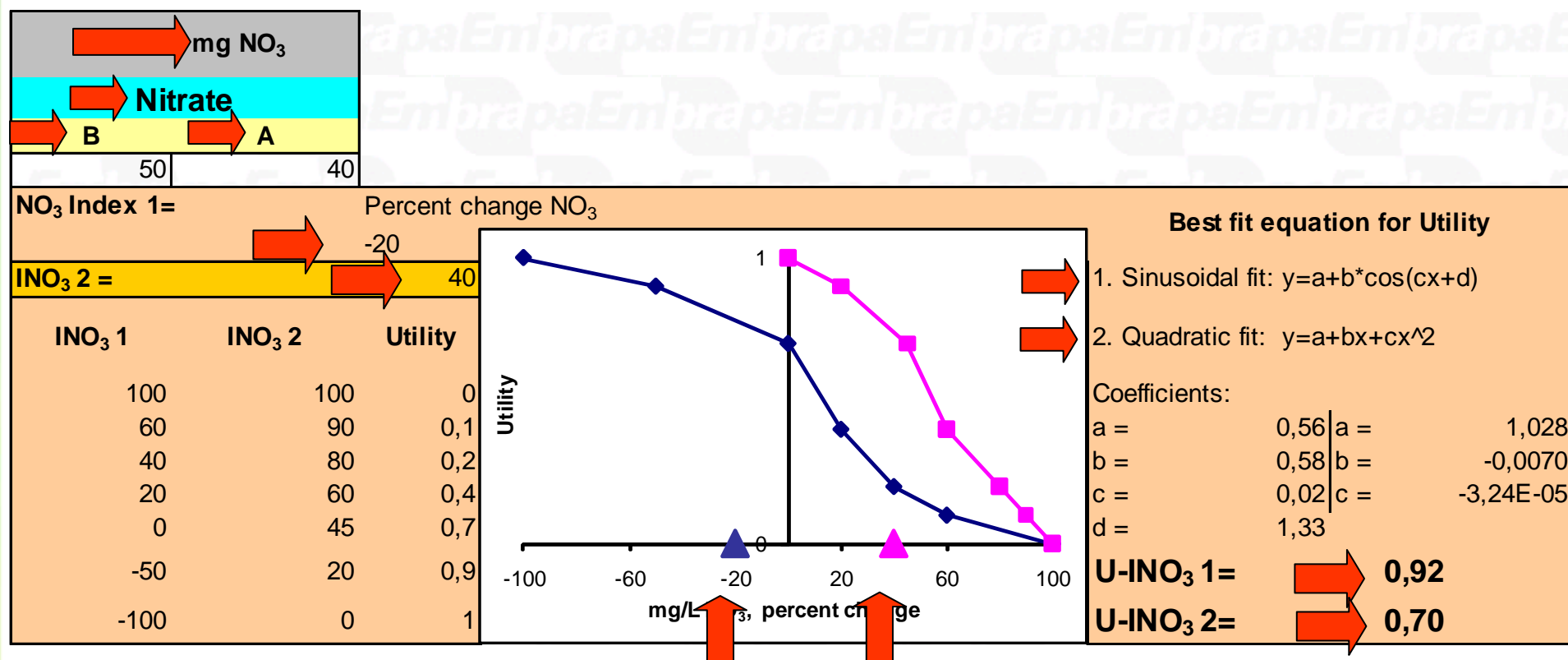
- 57 Manager profile & dedication
- 58 Commercialization conditions
- 59 Wastes management
- 60 Management of chemical inputs & residues
- 61 Best management practices & efficiency
- 62 Monitoring & Documentation
- 63 Local community relations
- 64 Institutional relationships

- The original system (*APOIA-NovoRural*) has been extensively tested elsewhere in varied contexts *and* in oil palm evaluation, before being adapted to conform with RSPO's PC&I;
- The aim is to provide an expeditious field assessment that can be immediately translated into a PC&I conformity checklist, while remaining as a documented, objective and quantitative sustainability assessment for conditions observed in the field;
- The focus is to foster environmental performance, while supporting recommendations on agricultural management for sustainability.
- The present moment is of promoting field trials and dialogue with stakeholders and users, to adapt the system to their particular needs and submit to their approval.

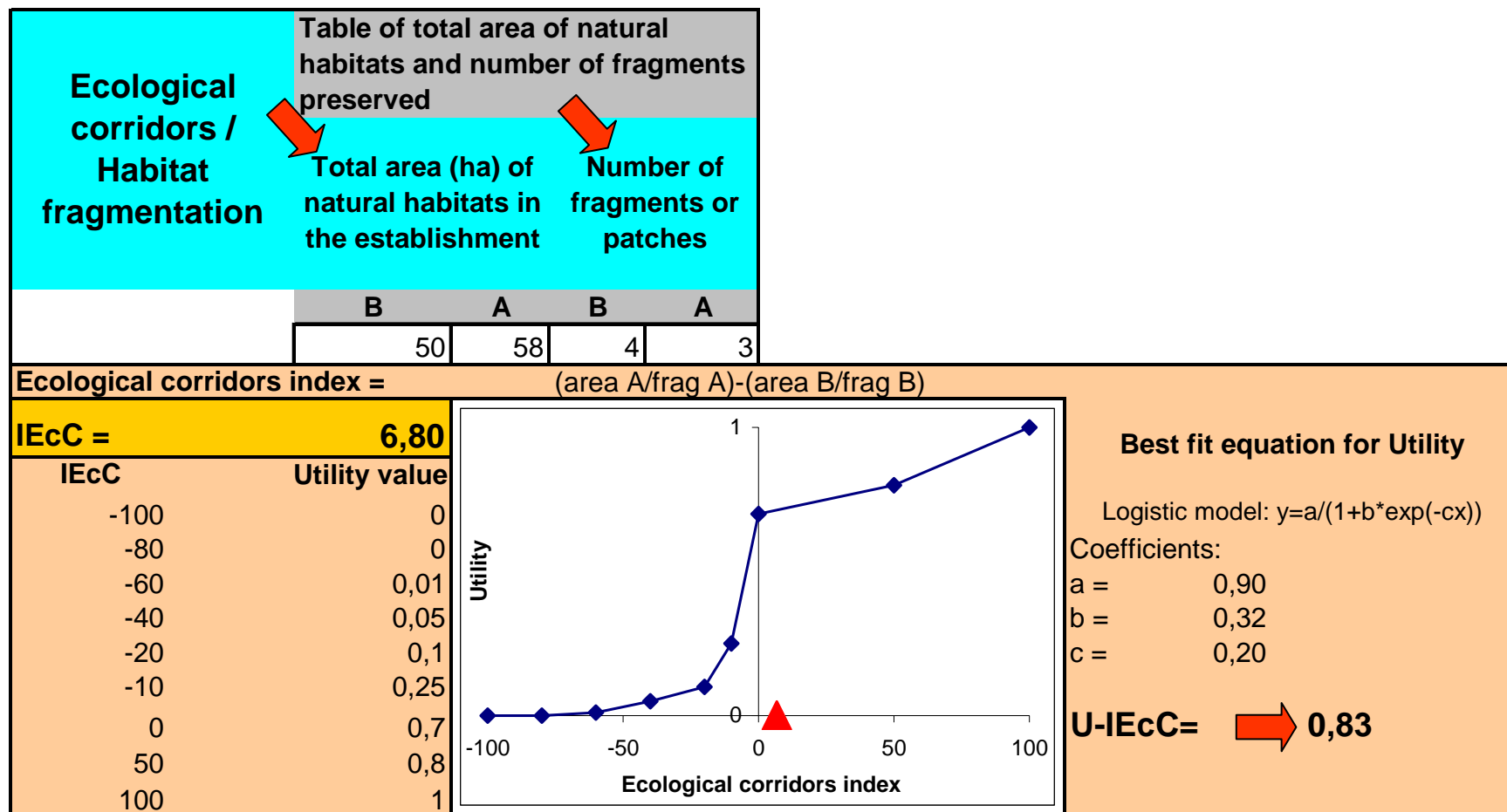
## ***APOIA-OilPalm***

- The ‘rural establishment’ (i.e., landholding, plantation) is the spatial scale of evaluation, which is performed analytically and quantitatively in a field survey supported by an integrated set of scaling-checklists;
- Sustainability indices are calculated and expressed as utility values (0-1.0), with sustainability conformity level standardized at 0.7 according to environmental standards and socioeconomic benchmarks;

# Typical scaling checklist for Indicator assessment and Utility valuation

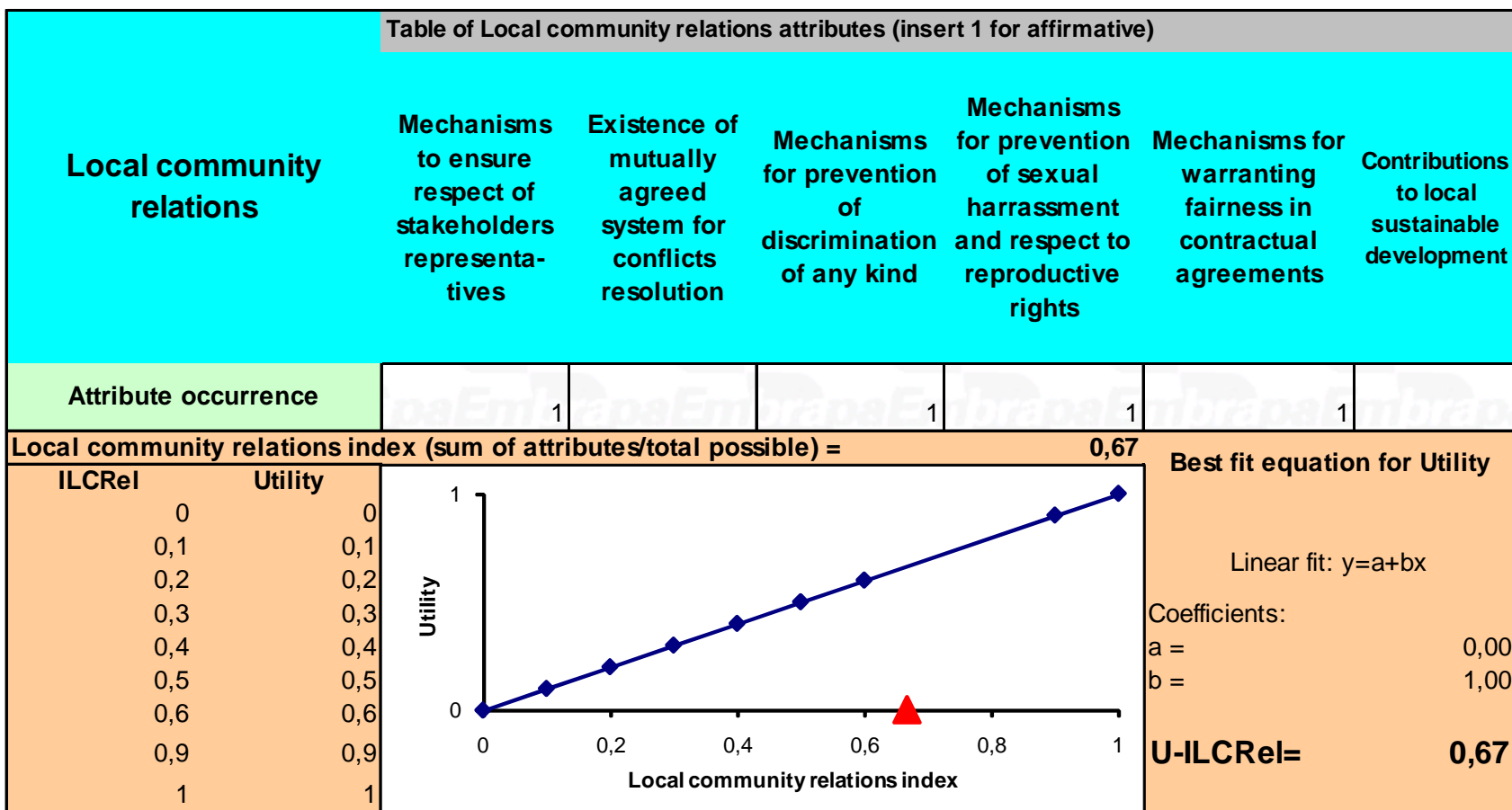


Each indicator is constructed according to appropriate field variables, utility correspondence table and transformation function

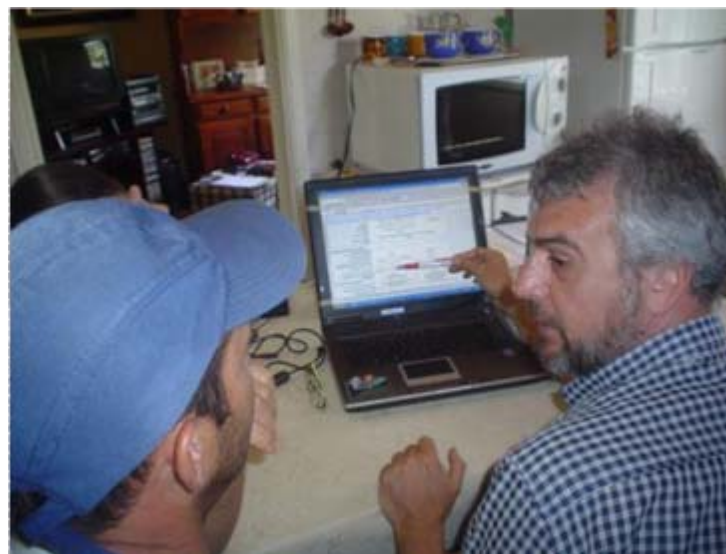




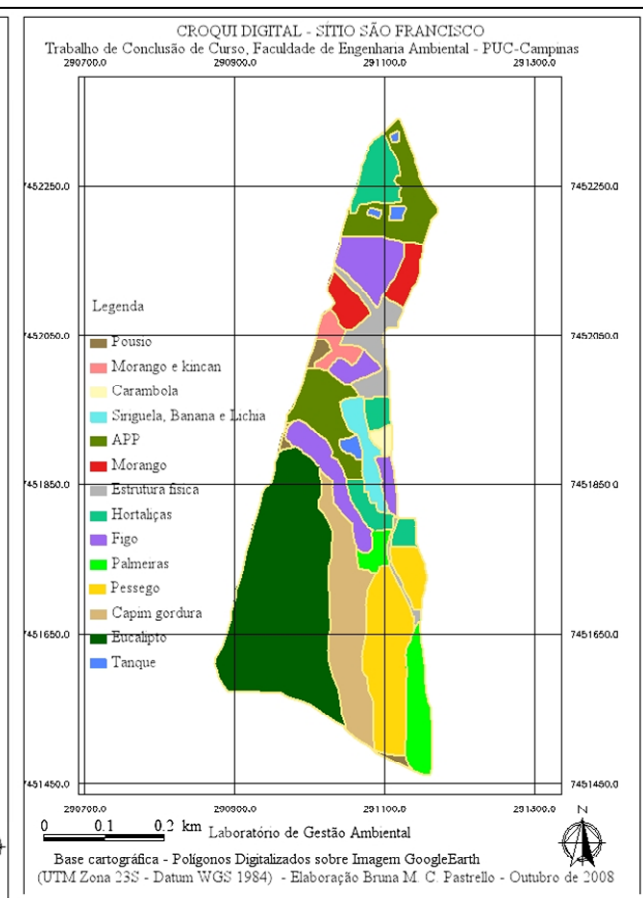
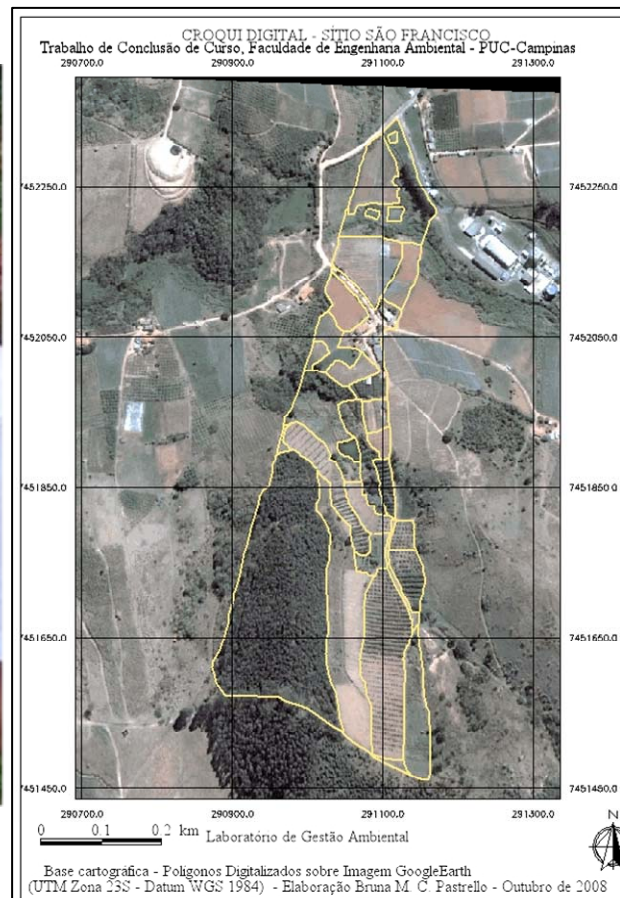
## Several indicators have been included to represent specific Criteria and Indicators proposed by RSPO



# Field survey, sampling, and interview



## Land uses, natural habitats, agricultural production areas and Rural establishment layout





- Example of “*Environmental Management Report*” issued to the farmers, which includes a CD-ROM with all complementary field results and recommendations.

## “Gestão Ambiental de Culturas Oleaginosas para Obtenção de Biocombustíveis, Cássia (MG)”

**APOIA-*NovoRural***



**Cultura de Nabo Forrageiro em Sistema de Plantio Direto  
Fazenda Boa Esperança**

Apoio



Realização



Meio Ambiente

Design: Silvana C. Teixeira Estevão (Embrapa Meio Ambiente/2006)



**A preliminary case study: environmental management in a rural establishment dedicated to oil palm production in Santo Antônio do Tauá (PA - Brasil)**

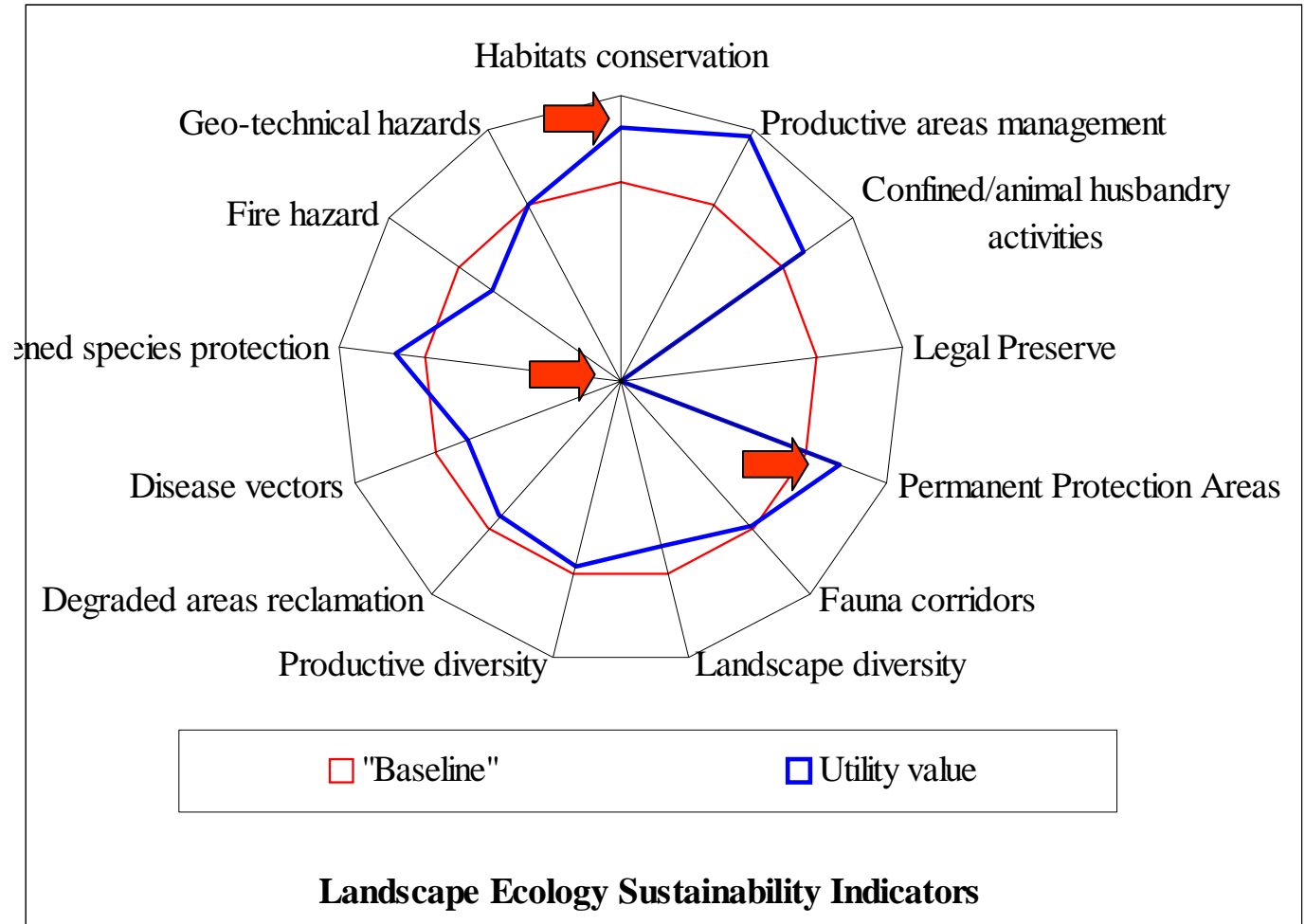


# • Landscape Ecology Dimension

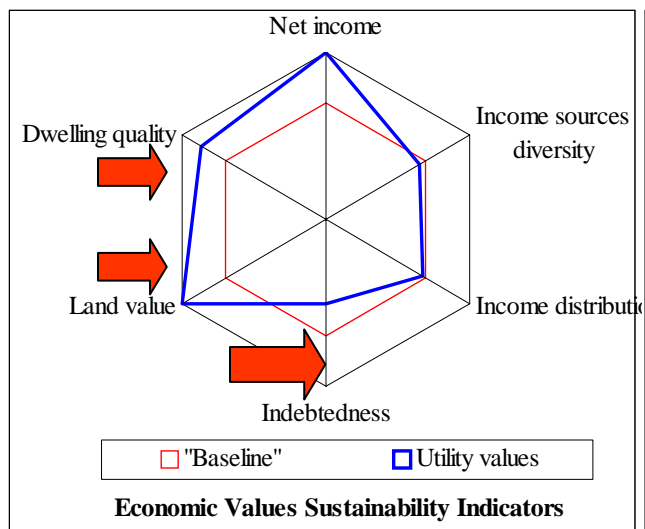
A very diversified farm



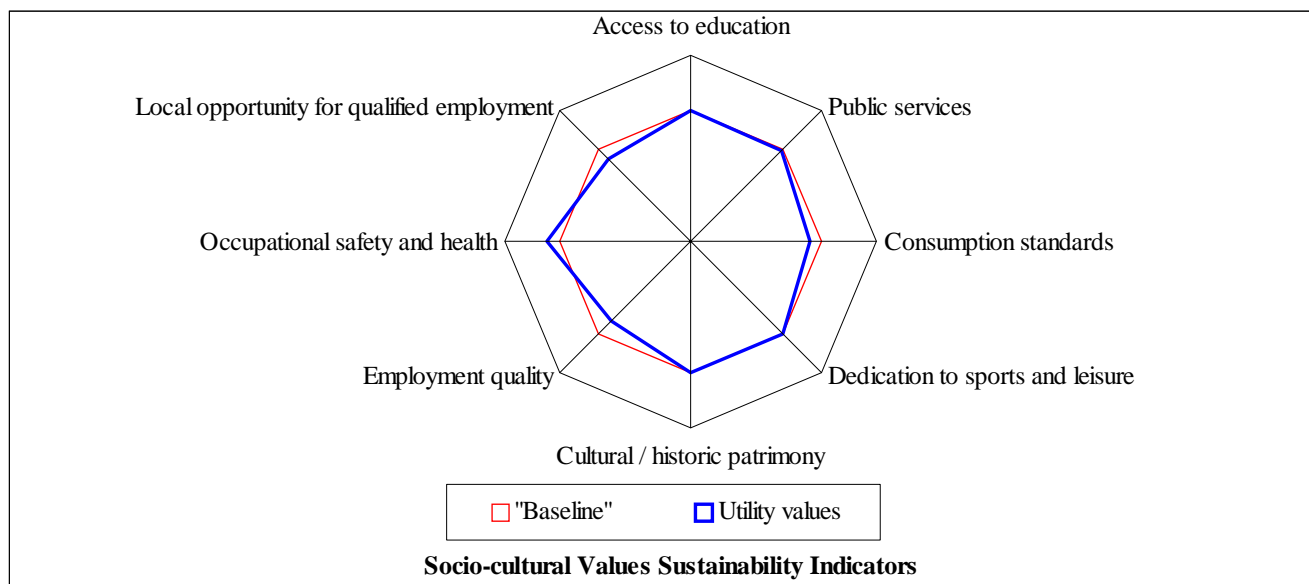
Mean sustainability index = 0.67



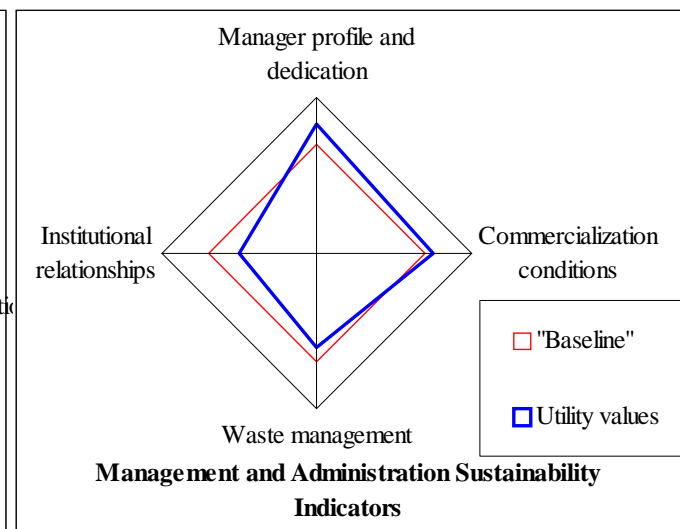
• **Economic Values**  
mean = 0.78



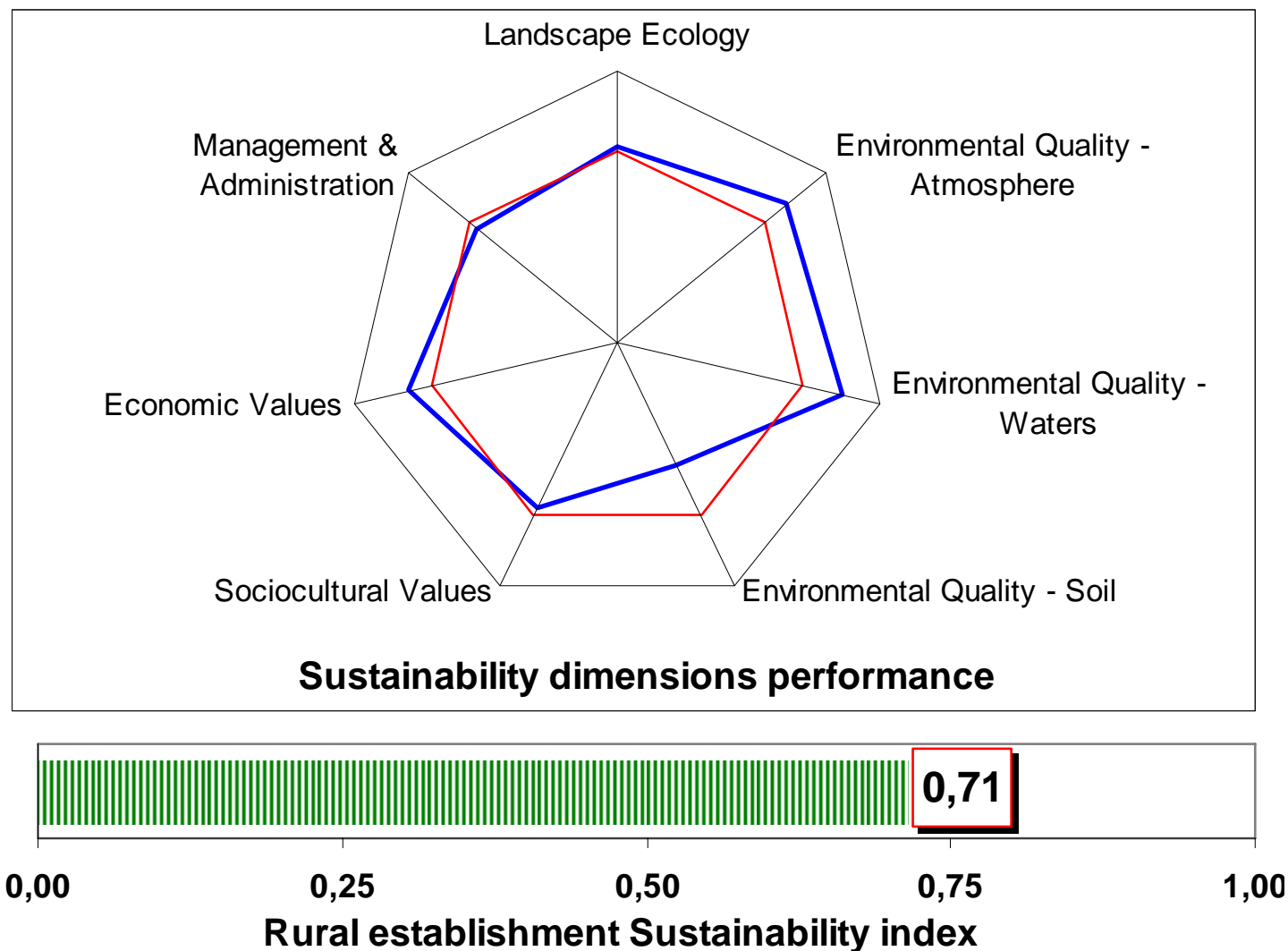
• **Socio-cultural Values**  
mean = 0.68



• **Management and Administration**  
mean = 0.67



## Oil palm production at Ishihara Farm





Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

## Environmental Impact Assessment Review

journal homepage: [www.elsevier.com/locate/eiar](http://www.elsevier.com/locate/eiar)



### Integrated farm sustainability assessment for the environmental management of rural activities

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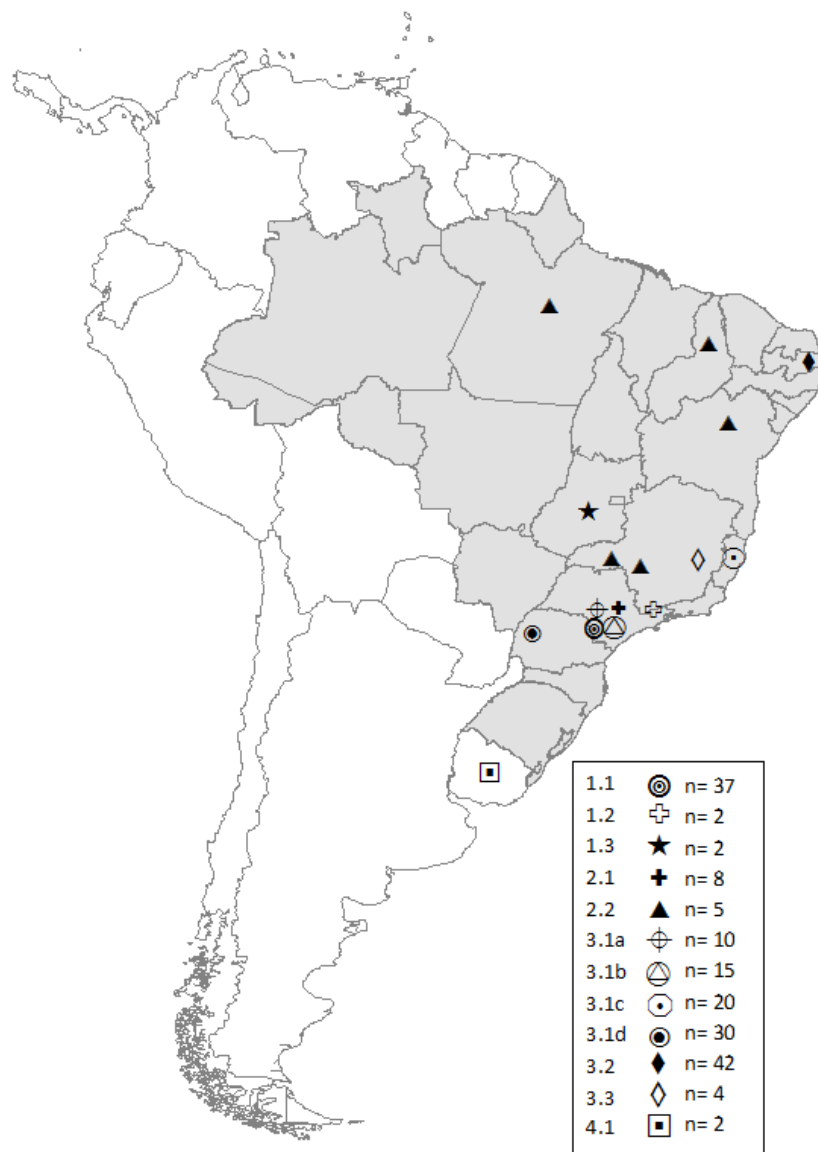
Sustainable agriculture

Rural development

APOIA-NovoRural

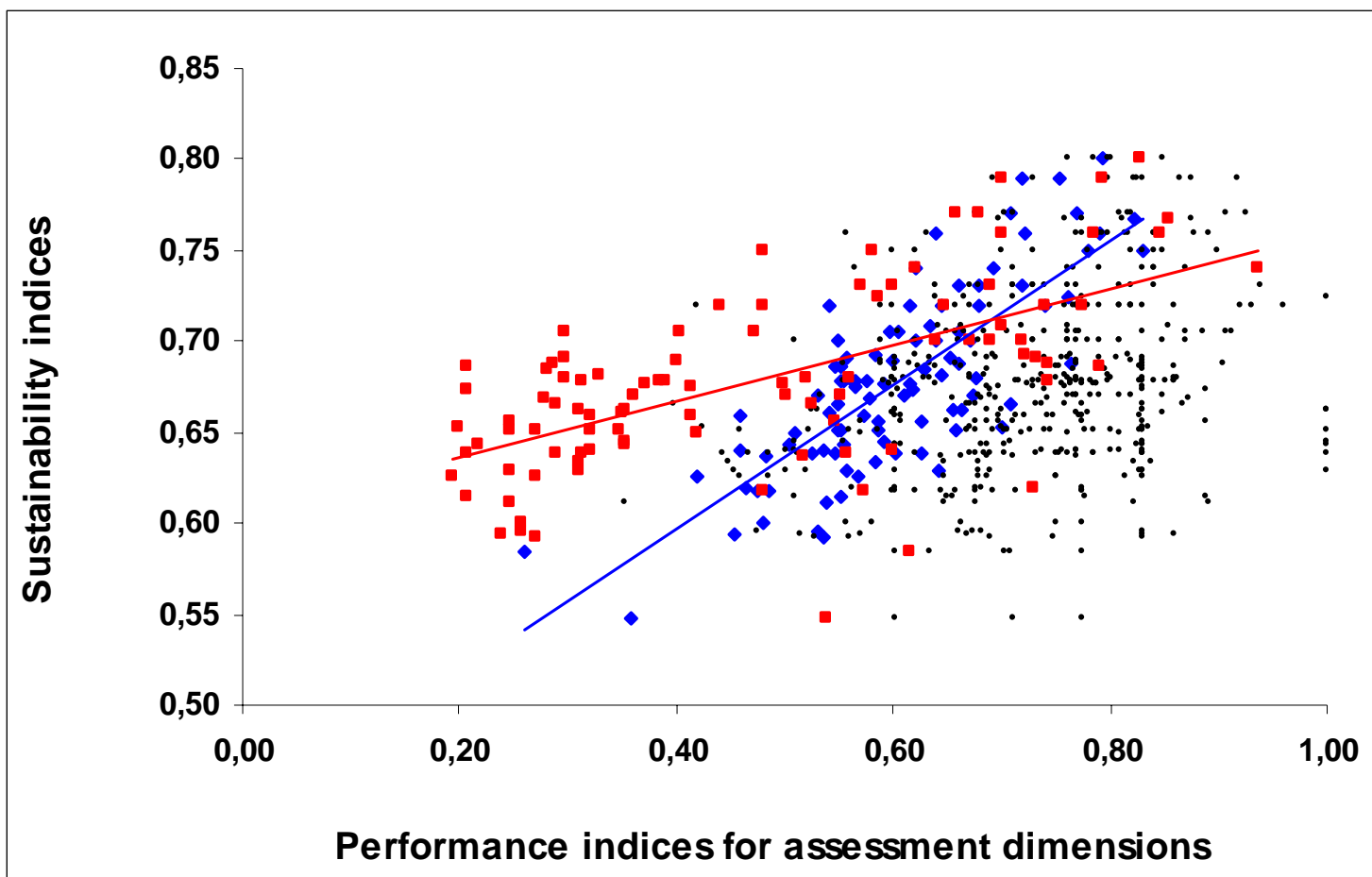
#### ABSTRACT

Farmers have been increasingly called upon to respond to an ongoing redefinition in consumers' demands, having as a converging theme the search for sustainable production practices. In order to satisfy this objective, instruments for the environmental management of agricultural activities have been sought out. Environmental impact assessment methods are appropriate tools to address the choice of technologies and management practices to minimize negative effects of agricultural development, while maximizing productive efficiency, sound usage of natural resources, conservation of ecological assets and equitable access to wealth generation means. The 'system for weighted environmental impact assessment of rural activities' (APOIA-NovoRural) presented in this paper is organized to provide integrated farm sustainability assessment according to quantitative environmental standards and defined socio-economic benchmarks. The system integrates sixty-two objective indicators in five sustainability dimensions – (i) Landscape ecology, (ii) Environmental quality (atmosphere, water and soil), (iii) Sociocultural values, (iv) Economic values, and (v) Management and administration. Impact indices are assessed in three integration levels: (i) specific



Scope of analysis	Case study	References
<b>1. Specific agricultural production system / activity</b>	1.1 Family farming sustainability – horticulture, agro-tourism, fee-fishing	Rodrigues et al., 2003b; Rodrigues et al, 2006b
	1.2 Integrated Fruit Production	Buschinelli et al., 2007; Calegario et al., 2009
	1.3 Precision agriculture	Rodrigues et al., 2008b
<b>2. Agricultural productive sectors</b>	2.1 Ostrich farming	Rodrigues et al., 2007a; Rodrigues et al., 2008a
	2.2 Oleaginous crops for biodiesel	Rodrigues et al., 2007b; Rodrigues et al., 2009b
	3.1 Organic agriculture and agro-tourism sustainable management	Rodrigues et al., 2006a
<b>3. Territorial environmental management</b>	3.2 Rural activities in the Mamanguape Protection Area	Rodrigues et al., 2008c
	3.3 Rural establishments around the Caratinga Biological Station	Lino et al., 2009
<b>4. Countrywide rural development program</b>	4.1 Integrated natural resources and biodiversity management project, Uruguay	Rodrigues and Moreira-Viñas, 2007a;b





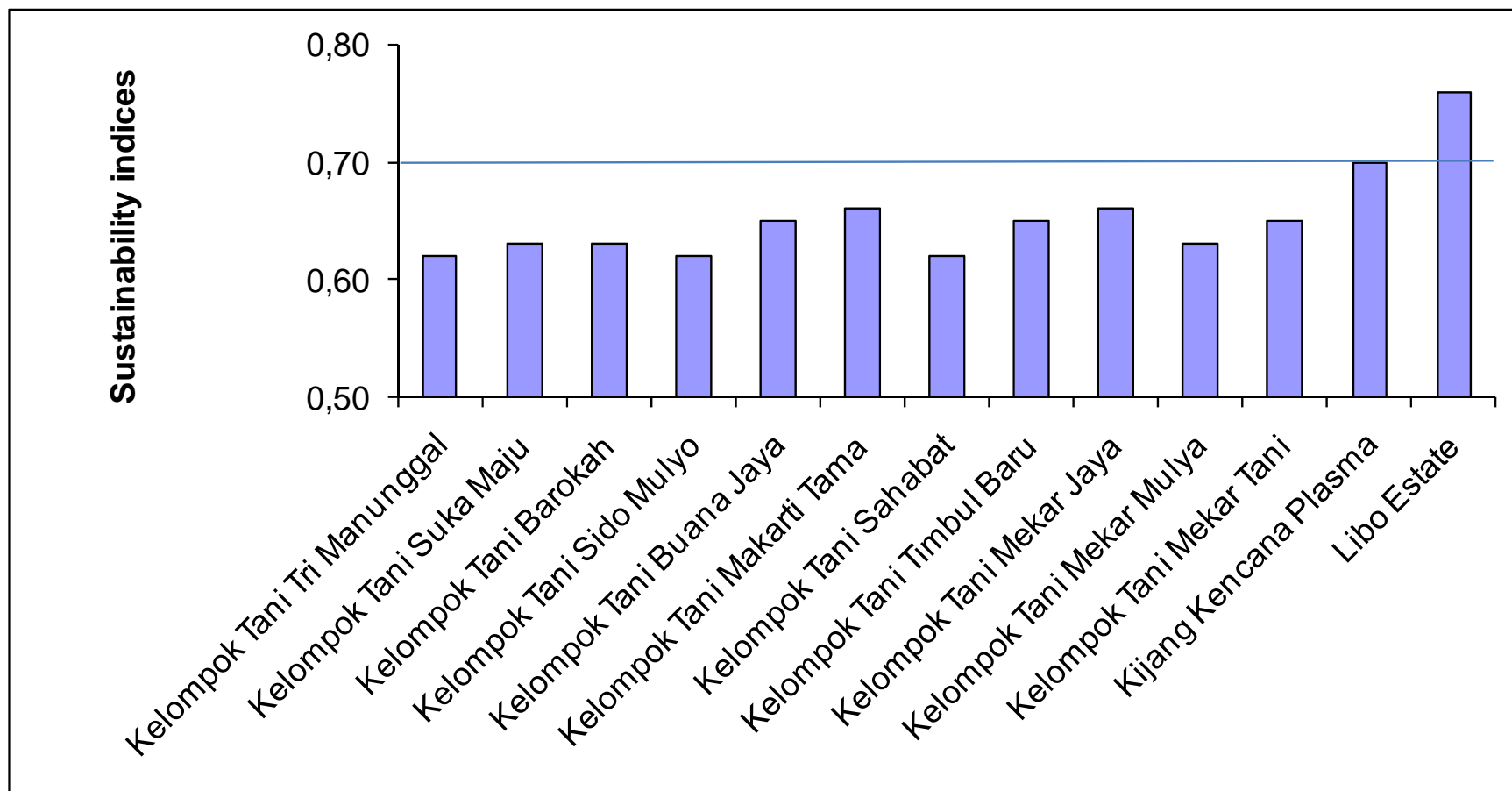
- Results of case studies carried out with the APOIA-NovoRural system (n= 177), showing the distribution of sustainability and impact indices.
- Dimensions with stronger correlations, i.e., Landscape ecology (♦ - coef corr = 0.78) and Management & administration (■ – coef corr = 0.62) are emphasized.

## ***APOIA-OilPalm Field trials in Indonesia - Nucleus (Libo) and Plasma areas (smallholders)***

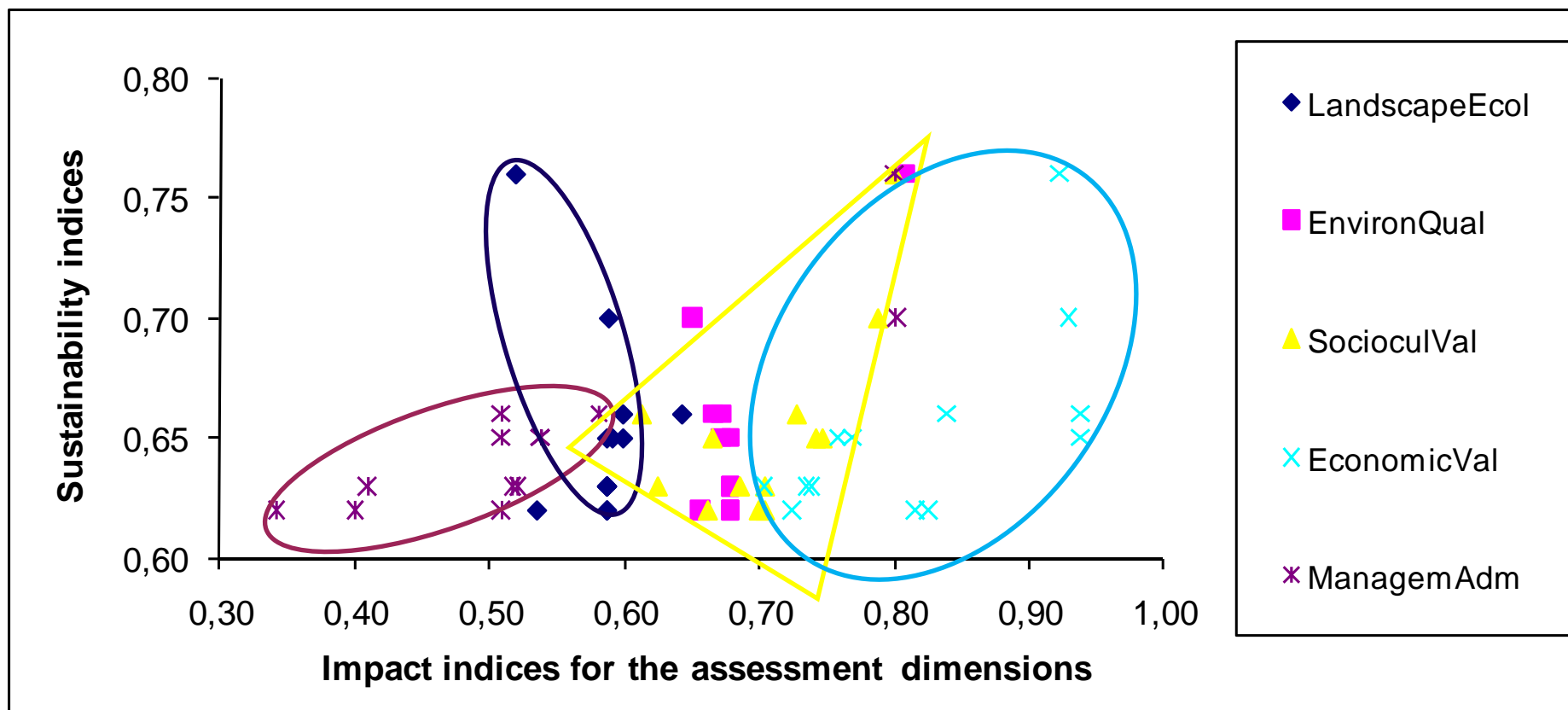
***Follow up on the training  
seminar at SMARTI***



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**Case study results: sustainability indices for selected oil palm landholdings in Riau, Indonesia.**



## Case study results:

- ✓ opportunity for improvement in Management indicators;
- ✓ important negative impact on Landscape ecology;
- ✓ general improvement in the indicators of Sociocultural values;
- ✓ important positive impact in the indicators of Economic values;



## Conclusions

- ✓ The impact assessment and ensuing sustainability index proposed by the APOIA-OilPalm system can be a practical, expeditious, inexpensive step in the preparation for eco-certification, according to RSPO-defined PC&I;
- ✓ High levels of correlation were observed between the sustainability indices and all sustainability dimensions except Landscape ecology (negative correlation -0.36) implying that sustainability attributes have been attained at the expense of nature conservation (no surprise, and particular indicators, such as HCVH and Protection of relevant ecological species, may preclude certification);
- ✓ The simultaneous involvement of smallholders and large scale establishments, with data analysis carried out altogether, imply good malleability both for the set of indicators and for the composite sustainability index provided by the APOIA-OilPalm approach.



# Profile

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- 1986 Master in Plant Biology (UNESP, Brazil)
- 1987 Enters Embrapa Environment
- 1995 PhD Ecology and Evolutionary Biology (Cornell University, USA)
- 2001 Post Doctorate, Environmental Policy (Univ. Florida, USA)
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